Lawrence Livermore National Laboratory

PLANT ENGINEERING
ENGINEERING/CONSTRUCTION DEPARTMENT

QUALITY ASSURANCE PLAN
for
LLNL FACILITIES STANDARDS

October 1, 2000

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1. INTRODUCTION

This Quality Assurance (QA) Plan for Lawrence Livermore National Laboratory (LLNL) Facilities Standards describes the management and administrative controls required for the development and implementation of LLNL Facilities Standards. These controls are mandatory when they affect the objectives of this QA plan.

This QA plan meets the intent of Department of Energy (DOE) Order DOE 5700.6B; it is written under the guidance of PEL-P-01010, the Plant Engineering QA Manual, (version dated May, 1991).

Other QA plans, whether for short or long term use, may prescribe additional objectives, however, compliance with this QA plan remains a minimum requirement.

2.   QA OBJECTIVES

This QA plan ensures that the:

*   Content of LLNL Facilities Standards (1) reflect the best current engineering practice, and (2) contain provisions for the health and safety of employees and the general public, application of Integrated Safety Management (ISM) principles, and the protection of the environment.

*   Development, production, and maintenance of all LLNL Facilities Standards are in accordance with the highest standards of quality to assure they will function as intended.

3. BASIS OF QA PLAN

3.1 QA GOALS

The goal of this QA plan is to provide procedures that ensure the ongoing production and maintenance of LLNL Facilities standards in conformance with Management Policy Memoranda (MPM) 26, *Use of Standards at LLNL*, as well as adequate technical and administrative review and documentation, as described herein.

3.2 SCOPE OF THE QA PLAN

The scope of this QA plan comprises all work that can directly affect achievement of the QA objective or QA goals (either in a supportive or adverse manner). The scope, therefore, includes work and conditions controlled by the standards manager (SM), and includes work or conditions controlled by others that must be monitored.

3.3 HIERARCHY OF REQUIREMENTS

The hierarchy of requirements established for this plan are given in MPM 26.

Where conflicting requirements exist, the higher level requirements shall govern. The departure from the lower level requirements to resolve the conflict shall be documented in the QA records.

Where lower level requirements conflict with higher level documents that are known to be out-of-date or otherwise insufficient, the lower level document may govern, provided that the departure from the heirarchy is explained and documented in the QA records.

4.   RESPONSIBILITY

4.1   RESPONSIBILITY, AUTHORITY, AND ACCOUNTABILITY

The organizations and individuals listed in Section 4 are responsible for environment, safety, and health (ES&H) protection, quality assurance in standards work management, and quality control in standards production.

Personnel responsible for work management may delegate authority to others to act for them in specified situations, or re-assign responsibilities within the functional line, project, or operation. In either case the responsible personnel remain accountable for what happens.

Each person working on LLNL Facilities Standards is responsible for learning and practicing the safety guidance, regulations, and controls stated in the LLNL *Environmental, Safety, and Health Manual* (ES&H manual) including principles of ISM.

4.2   AREAS OF RESPONSIBILITY

A.   Plant Engineering Department Head: The Plant Engineering department head is responsible for:

   1.   Issuing this QA plan and any revisions.

   2.   Assisting the standards manager in assuring acceptable results from work controlled by others when that work can affect achievement of a QA objective or QA goal.

   3.   Managing QA audits of the work management system and QA plan.

B.   Authority Having Jurisdiction (AHJ) for Facilities: The LLNL AHJ for facilities is responsible for resolving any technical disputes that may arise for a given standard, and has the final word in such a dispute.

C.   Standards Manager: The standards manager is responsible for:

   1.   The overall production, maintenance, and distribution of LLNL Facilities Standards.

   2.   Validating and managing the standards budget.

   3.   Giving cohesive leadership and guidance

   5.   Monitoring the interface between organizations on standards related issues.

D.   Standards Editor: The standards editor is responsible for:

1.   Ensuring that each standard is correctly integrated into the overall body of LLNL Facilities Standards.

2.   Ensuring that each standard has been reviewed by all the necessary parties and all comments have been incorporated or otherwise resolved.

3.   Maintaining a file of QA records relevant to each standard.

4.   Coordinating all aspects of document production for each standard, including preparing first drafts, coordinating reviews, incorporating final comments, and distributing the standard.

E.   Principal Engineer/Architect (PE/A): Each PE/A is responsible for the technical accuracy and completeness of each standard pertinent to his or her particular discipline.

F.   Standards Representative for Maintenance and Operations: The Maintenance and Operations standards representative is responsible for ensuring that the content of each standard conforms to requirements of Maintenance and Operations.

G.   Standards Representative for Hazards Control: The standards representative for Hazards Control is responsible for ensuring that the content of each standard conforms to requirements of the Hazards Control department.

H.   Standards Representative for Security: The standards representative for Security is responsible for ensuring that the content of each standard conforms to requirements of the Security department.

4.3   INTERFACE MONITORING

LLNL Facilities Standards have significant interfaces between the following organizations:

•   Plant Engineering
•   Environmental Protection
•   Hazards Control
•   Security
•   LLNL Programs

As stated in Section 4, the standards manager is responsible for monitoring the interface between organizations and shall resolve any problems that may arise, or shall alert others in authority as needed to resolve problems.

5.   WORK SUPPORT ACTIVITIES

5.1   DOCUMENT CONTROL

The QA documents that govern the maintenance of LLNL Facilities Standards are listed in appendix E.

5.1.1   **Minimum Controls** The title or first page of each new or revised standard shall include (1) the title or subject, date of issue, and document and revision numbers, and (2) the following notations and signatures as evidence that the required controls have been exercised:

Document Responsibility---Noted and signed to signify that the standard is approved for use as intended.

Standards Issuance---Noted and signed to signify:

1.   The standard was reviewed by personnel other than those who prepared or revised it or supervised the effort;

2.   The standard was reviewed by those who will manage or supervise its use;

3.   Review comments were resolved and the standard is ready for use; and

4.   Responsibility is accepted for providing the required QA records, maintaining and distributing the standard, and guidance to ensure proper use.

Independent reviews may either be noted on the standard or in records readily traceable to the standard via the QA records file.

5.1.2   **Principal Documents** This QA plan is a principal document of the Plant Engineering QA Program. As such, all revisions to it shall be reviewed and signed off by the Plant Engineering QA manager. The original, signed version of this QA plan shall be kept in a separate folder in the same location as the rest of the QA documents (see Document Availability, below).

5.1.3   **Review of Documents** The individuals with document responsibility shall keep their respective documents up-to-date. Documents will be reviewed periodically to determine when and where changes are necessary. As a minimum, the first review will be conducted within one year of issue. The period between subsequent reviews can be extended gradually when there are no adverse findings, but never beyond three years. If there are adverse findings, the next period will be shortened appropriately. In addition, reviews will be conducted:

1.   When significant changes are made in technical or administrative requirements in a standard.

2.   In response to instructions from the audit manager (PE department head).

A revised standard will be prepared when standard reviews dictate subsequent changes to documents. Revised standards shall be reviewed and controlled the same as the original.

5.1.4   **Document Availability** Issued standards shall be controlled to ensure that (1) the correct revisions are distributed to the right individuals, and (2) they are maintained in specified, accessible places to facilitate reference by those who need the information.

One complete, up-to-date set of the QA documents shall be kept in one manual or file cabinet by the standards manager.

5.2   RECORDS CONTROL

5.2.1   **General** QA records required by this plan are listed in appendix F. QA records are documentary evidence of work performed, or results of QA-related actions. QA records shall each contain the following, at a minimum:

1.   The work record, or results obtained.

2.   The date or period of performance.

3.   The responsible individual's signature.

Documents and records provided by other organizations or individuals shall be reviewed and accepted within the organization of the standards manager.

5.2.2   **QA Record Retention** The standards manager shall be responsible for the retention of QA records. QA records shall be prepared, archived, and made readily available as evidence that standards are reviewed, issued, and distributed as intended. They shall be protected and maintained for the periods given in appendix F. The standards manager may (1) issue directives either limiting or extending the retention period for specific records or types of records, and (2) specify methods of disposal.

5.3   SIGNATURE RULES

A.   Documents shall be signed only by those who have the authority to do so.

B.   The meaning of a signature on the document and signature authority (e.g., position title) shall be indicated in a QA record traceable via the QA records file.

C.   An individual in a higher-level position in the same functional line can act for, and sign for, the indicated person.

D.   An alternate individual can sign for the indicated individual -- if authorized to do so in writing and such authorization is placed in the QA file.

5.4   ENVIRONMENT, SAFETY AND HEALTH PROTECTION

A significant part of quality assurance is "due consideration for health, safety, property and the environment." Due consideration means full support of LLNL policy regarding ES&H. The standards manager will ensure that:

•   All standards are in accordance with LLNL policy.

•   All standards are in accordance with the documents listed in appendixes D and E.

5.5   TRAINING MANAGEMENT

The training of all PE design professionals shall include an orientation to standards and their role at LLNL.

5.6   QUALITY PROBLEM CORRECTION

5.6.1   **General** A "quality problem" is a technical or administrative error, omission, or oversight in a standard which, if not corrected, could lead to unacceptable consequences. The problem may be any deficiency or discrepancy that can affect safety, construction or fabrication quality, or code compliance.

5.6.2   **Responsibility** The standards manager shall, by personal action or through written assignments and instructions:

•   Initiate corrective action for all items brought to his or her attention.

•   Follow up to ensure that corrective action produces satisfactory results and close out completed actions.

•   Continue monitoring to prevent repetition of the problem.

5.6.3   **Minimum Requirements** Anyone who detects a quality problem shall promptly notify the individual with document responsibility for the standard in question. The responsible individual will consult with the standards manager to ensure that:

1.   Personnel are notified where work will be affected by the problem or corrective action.

2.   Unacceptable items are controlled to prevent inadvertent use, and corrected or replaced.

3.   Conditions and work processes are controlled to prevent the problem from spreading.

4.   The problem, including any indirect cause, is corrected as soon as practical.

5.   The standard and any associated records are controlled to ensure correct documentation.

6.   Records, if required, trace the problem through control, correction and close out.

5.6.4   **When A Correction Record is Required**   When any of the following apply, the quality problem and corrective action shall be documented and retained as QA records:

- The audit manager (PE Department Head) issues a directive to resolve an adverse finding (see section 7 below).

- The problem and/or corrective action will require changes in work-management for the work associated with the problem or in other areas.

- Without special precautions, the problem is likely to recur with unacceptable consequences.

- Corrective action will take more than a few days to complete and close out.

- Corrective action will involve two or more individuals or organizations that normally operate independently.

5.6.5   **Elements of the Record**   Each stage of documentation will be generated by the person responsible for the action or record. The record will trace control and changes from detection of the problem to close out, and will describe:

- The problem, unacceptable items, and how they were controlled.

- Instructions for correction of unacceptable items, elimination of the problem (including any indirect cause of unacceptable items).

- Notifications, assignments, correction schedules or due dates, and distribution lists.

- The results of corrective action, acceptance of final conditions, and close out.

The correction record shall be reviewed and signed off by the standards manager. Copies of required records will be distributed to all who need to know: (1) when corrective action has been assigned, and (2) following closeout of the problem.

5.6.7   **Change Control: Issued Documents and QA Records**   Changes in issued documents and other QA records to correct quality problems shall be controlled at the same management level and to the same degree as the original documents and records.

6.   WORK CONTROLS

6.1   GENERAL

Formal work controls are documented requirements to govern the sequence of work, clarify or verify the status of items and work, and control performance. Their intent is to ensure that all work meets the goals and objectives of this plan by limiting the probability of unacceptable consequences that results from sole reliance on informal leadership and practices.

Areas of work-management responsibility for LLNL Facilities Standards management and supervision are defined and assigned in section 4 of this QA plan. These individuals have prime responsibility for how effectively the plan, including the following work controls, is implemented in their assigned areas. Where work controls are not prescribed, they are still accountable for establishing good practices of work management and performance that support achievement of the QA objectives and QA goals.

6.2   WORK REQUEST AUTHORIZATION CONTROL

All standard revisions shall be initiated by submitting a standard action request to the standards manager for review and approval. The standard action request procedure ensures that the proposed work is consistent with the overall standards effort.

6.3   ACCEPTANCE CONTROL

Standards are accepted for use when each area of work management responsibility has reviewed and accepted a proposed standard, and the standard is issued. All review comments shall be made part of the QA record file. When disputes occur between different work management areas, the standards manager shall bring the disputing parties together to resolve the issue. In matters of engineering practice, the AHJ for facilities shall have the final word, although objections shall be recorded in the QA record file. In matters other than engineering practice, the PE Department Head shall have the final word when disputing parties cannot reach agreement among themselves.

7. QA PLAN MAINTENANCE

7.1 QA PLAN BRIEFINGS

Compliance with this plan is the responsibility of everyone assigned work on an LLNL Facilities Standard. It is necessary, therefore, that all persons working on standards understand this QA plan and the QA system prescribed by it. The standards manager will ensure that each person assigned to work on a standard reads this QA plan and is periodically instructed on quality goals, work controls, procedures, and responsibilities, with emphasis on how each individual fits into the overall QA system.

7.2 QA AUDITS

The audit manager (PE Department Head) shall arrange for periodic audits of the work management system and the QA plan. QA audits shall be scheduled and repeated at pre-determined intervals. The interval between audits will be based on the stability and maturity of the work management system. Audits will be managed, performed, reported, and responded to as prescribed in the PE QA Plan.

7.3 MANAGEMENT REVIEWS

Management reviews are periodic investigations and evaluations of the work management system and QA plan. The purpose is to either (1) verify that the work management system effectively supports achievement of the QA objectives and QA goals and the plan correctly defines the work management system, or (2) to make corrections or improvements where needed.

7.3.1 **Responsibility** The standards manager shall request management reviews of the work management system and QA plan. The actual review shall be performed by the standards manager's immediate supervisor within the standards manager's organization.

7.3.2 **Planning** Management reviews shall be planned to investigate compliance with applicable QA plan requirements and to evaluate the effectiveness of these requirements. Each review will be divided into staggered interviews so the reviews do not significantly disrupt work in progress.

7.3.3 **Performance** Management reviews will be performed as planned, but the reviewer will digress from the plan to adequately investigate the problem wherever discrepancies or deficiencies are found. Each review will include one-on-one discusssions and checks of QA records.

7.3.4   **Corrections and Improvements** As a follow up to management reviews, the standards manager will, as appropriate:

   •   Initiate action items for improvements or the correction of quality problems.

   •   Issue commendations on jobs well done.

   •   Caution personnel regarding potential quality problems.

   •   Note completion and closeout of the review.

   Action items for correction of quality problems will be initiated as prescribed in section 5, above. The individual responsible for the management review will review improvement and correction results, and will close out each action item in writing or initiate further action.

7.3.5   **QA Records Related to Management Reviews** As a minimum, management review QA records will note the reviewer, dates of interviews, the individuals interviewed, any findings (significant positive findings and quality problems), and closeout of the review.

APPENDIX A: *ASSIGNED PERSONNEL*

Revision of this appendix: 0   Issued: _____   Date: _9/25/00_
                                          Standards Manager

Functional Role Described in Section 4.2   **Name**

PE Department Head . . . . Bernard Mattimore
Authority Having Jurisdiction (AHJ) for Facilities . . . . Dave Coats

Standards Manager . . . . Edward Farrell
Standards Editor . . . . Edward Farrell

Discipline Chiefs
  Civil . . . . Dave Littlefield
  Structural . . . . Madhu Kamath
  Architectural . . . . Dick Ling
  Mechanical (buildings) . . . . Barbara Quivey
  Mechanical (utilities) . . . . Jackie Marcisz
  Electrical . . . . Tony Maniatis
  Electrical (utilities) . . . . Dave Johnson
  Industrial Electronics . . . . Moises Ostrovsky

Maintenance and Operations Representive . . . . Bill Kemp
Hazards Control Representative . . . . Jim Forte
Security Representative . . . . Paul Fink

Standards Issuance . . . . Edward Farrell
Document Responsibility (Engineering and Construction) . . . . Dave Coats
Document Responsibility (Maintenance and Operations) . . . . Bill Kemp

APPENDIX B: *OPERATING DIAGRAM 1:*
Developing a New Standard or Revising an
Existing Standard

Revision of this appendix: 0   Issued: _____   Date: 9/25/00
                                        Standards Manager

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                 │ to resolve issues. │
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           │ Principal engineer/estimator │
           │ decides course of action │
           │ and exception sheet is │
           │ entered in the file. │
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           │  Standard is │
           │   issued.    │
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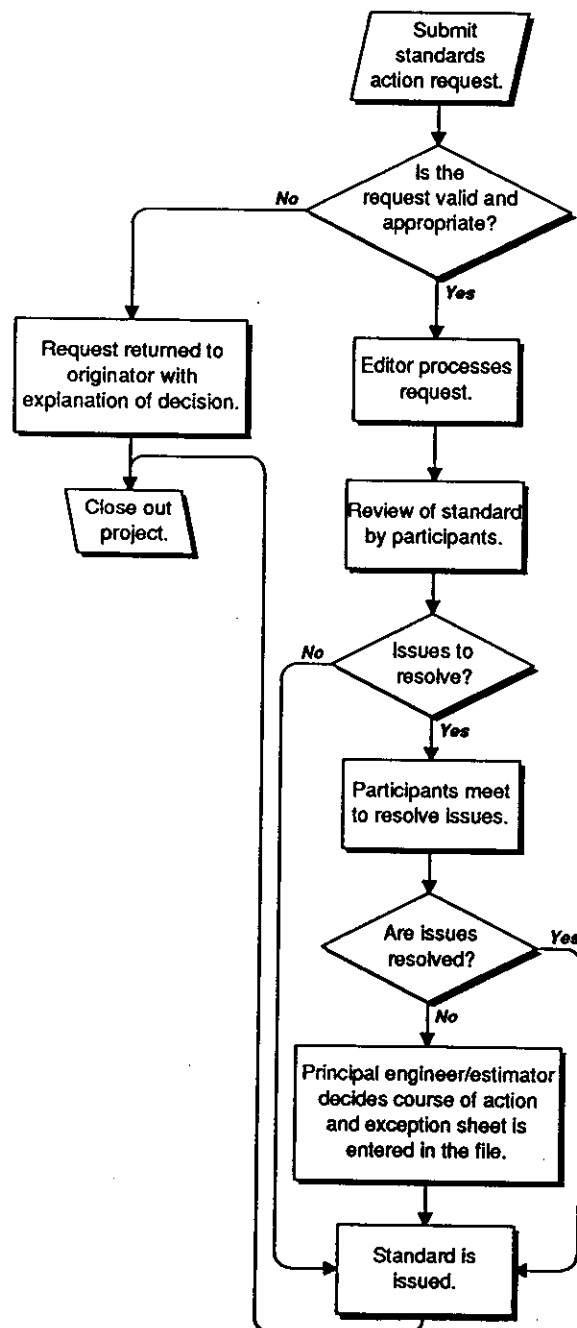
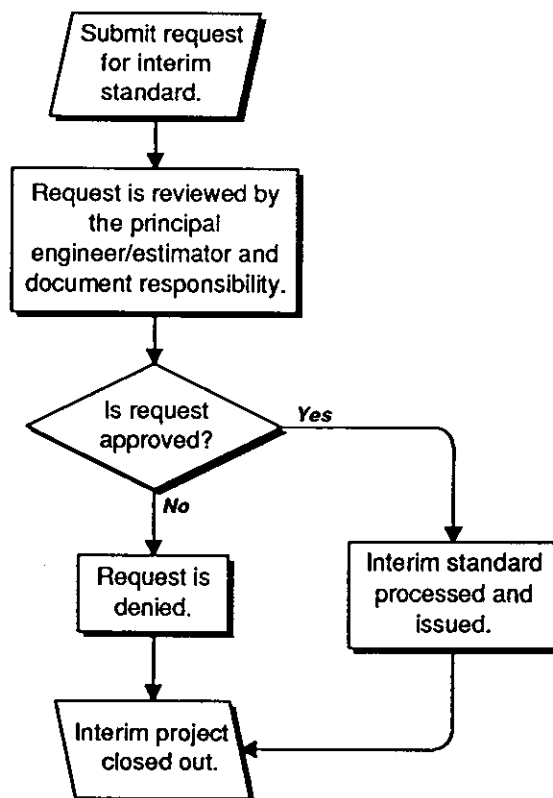## APPENDIX C: *OPERATING DIAGRAM 2:*
Issuing an Interim Standard

Revision of this appendix: 0   Issued: _____   Date: _9/25/00_
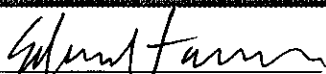   *Standards Manager*

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   │    the principal      │
   │ engineer/estimator and│
   │ document responsibility.│
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      │Request is │          │ Interim standard│
      │ denied.   │          │ processed and   │
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     / Interim project│◀─────────────┘
    /  closed out.   /
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APPENDIX D: *QA DOCUMENTS GOVERNING STANDARDS*

Revision of this appendix: 0   Issued: _(signature)_   Date: _9/25/00_

Standards Manager

File #	Document	Document Responsibility	Availability	Date of Issue
STD-01-D	Quality Assurance Plan	PE Department Head	Controlled	1/15/00

APPENDIX E: *REFERENCE DOCUMENTS*

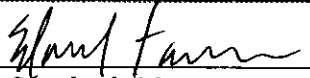Revision of this appendix: 0   Issued: _____   Date: _9/25/00_
Standards Manager

1.   PE Management Policy Memorandum 26, *Use of Standards at LLNL.*
2.   *Plant Engineering QA Manual*, PEL-P-01010.
3.   LLNL *Environmental, Safety, and Health Manual.*
4.   Plant Engineering *QA Plan*, November 1999.
5.   Laboratory Site Operations *QA Plan*, October 18, 1999.
6.   *Environmental, Safety and Health Self-Assessment Plan*, June 1999.

APPENDIX F: *QA RECORDS REQUIRED BY THIS PLAN*

Revision of this appendix: 0   Issued: _____   Date: _9/25/00_
                                          Standards Manager

File #	QA Record	Responsibility	Retention
Work Request Authorization Control Documents			
STD-01-R	Standard Action Request	Standards Manager	5 years
Acceptance Control Documents			
STD-02-000-R	Standard Review Comment Sheet	Standards Editor	5 years
STD-03-000-R	Exceptions Comment Sheet	Standards Editor	5 years
STD-04-000-R	Standard Review Distribution List	Standards Editor	1 year
Administative and Audit Records			
STD-22-000-R	Management review records	Standards Manager	5 years
STD-23-000-R	QA Audit records	Standards Manager	5 years

APPENDIX G: *GLOSSARY*

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                                         Standards Manager

Accepted for QA Program Use	The notation on this QA plan by the QA manager, to signify that the document conforms to applicable program plan requirements.
Audit Manager	The PE Engineering and Construction department head, who periodically conducts QA audits of the QA plan.
Document	Any form of printed or written information (other than a drawing) of what to do, use, construct or accomplish, e.g., a plan, specification, standard, procedure, or instruction.
Document Responsibility	The notation on a document, signed by a member of the project, to signify that the document has been reviewed, comments were resolved, and the the person who signed the document retains responsibility for the contents.
Elevated Quality Problem	One where responsibility for control and correction has been elevated by the original responsible person and accepted at a higher level of management.
Environmental, Safety and Health Self Assessment Plan	A plan for Plant Engineering that establishes a department review of ES&H issues.
ES&H	Environment, safety and health.
Issued	The notation on a document, signed by a designated person, to signify that the document is approved for the intended use.
Management Review	A periodic monitoring activity performed by the standards manager.
QA Audit	A formal, periodic investigation and evaluation that is managed by an audit manager and performed by selected teams of independent auditors.
QA Goal	A level of accomplishment or a condition to maintain that is essential to achievement of a QA objective.
QA Objective	A broad objective, such as a level of quality to be achieved in all work and end-products of the project, or a condition to maintain that is conducive to good work throughout the work management system.

QA Plan   The document that defines an organization's system of management for supporting achievement of its QA objectives and QA goals.

QA Program   The program of quality assurance and quality control for Plant Engineering that extends from management of the organization to process and product control and verification.

QA Record   Documentary evidence generated and retained as required in this QA plan.

Quality Assurance (QA) A systematic approach to work management to provide confidence that objectives will be achieved with due consideration for health, safety, property, and the environment.

Quality Control (QC)   Prescribed controls for work processes and items, and verification of conformance to requirements or simply the means for making sure designs, data, material, components, documents and conditions are as they should be, and that concepts are credible. Quality control is a subset of quality assurance.

Quality Problem   A deficiency or discrepancy which, if not corrected, could jeopardize achievement of a QA objective or QA goal, or lead to other unacceptable consequences.

Record   An issued document or documentary evidence of what was done or accomplished, or the results.

Responsible Individual The individual responsible for supervision of the area, work, or item where a quality problem is detected, or the individual who has document responsibility for a document with a problem.

Standards Manager   The Plant Engineering Standards and Documentation Group Leader, who is responsible for the overall management of the standards program in accordance with the QA documents listed in appendix E.

Work Management   All aspects of management necessary to assure quality of work. Work management includes the provision of resources, development of capabilities and a work system, creation of a productive work environment, direct supervision of work elements, evaluation of performance, and correction of deficiencies and discrepancies.